PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92bis.1 and Administrative Instructions, Section 422)

To:

GEARY, Stephen
W.H. Beck, Greener & Co.
7 Stone Buildings
Lincoln's Inn
London WC2A 3SZ
ROYAUME-UNI

Date of mailing (day/month/year)
10 September 2001 (10.09.01)

Applicant's or agent's file reference
SG/P8045WO

IMPORTANT NOTIFICATION

International application No.
PCT/GB00/03307

International filing date (day/month/year)
25 August 2000 (25.08.00)

1. The following indications appeared on record concerning:

[X] the applicant [ ] the inventor [ ] the agent [ ] the common representative

Name and Address
COLLAG LIMITED
Maidenstone Heath
Blundell Lane
Bursledon
Southampton SO31 1AA
United Kingdom

State of Nationality: GB
State of Residence: GB
Telephone No.:
Facsimile No.:
Teleprinter No.:

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

[X] the person [ ] the name [ ] the address [ ] the nationality [ ] the residence

Name and Address
AGFORM LTD.
Maidenstone Heath
Blundell Lane
Bursledon
Southampton SO31 1AA
United Kingdom

State of Nationality: GB
State of Residence: GB
Telephone No.:
Facsimile No.:
Teleprinter No.:

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

[X] the receiving Office
[ ] the International Searching Authority
[X] the International Preliminary Examining Authority
[ ] the designated Offices concerned
[X] the elected Offices concerned
[ ] other:

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland
Facsimile No.: (41-22) 740.14.35

Authorized officer
R. Raissi
Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Commissioner
US Department of Commerce
United States Patent and Trademark Office, PCT
2011 South Clark Place Room CP2/5C24
Arlington, VA 22202
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 22 June 2001 (22.06.01)	
International application No. PCT/GB00/03307	**Applicant's or agent's file reference** SG/P8045WO
International filing date (day/month/year) 25 August 2000 (25.08.00)	**Priority date** (day/month/year) 26 August 1999 (26.08.99)
Applicant MISSELBROOK, John	

1. The designated Office is hereby notified of its election made:

[X] in the demand filed with the International Preliminary Examining Authority on:

26 March 2001 (26.03.01)

[ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

[ ] was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer

Olivia TEFY

Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	**FOR FURTHER ACTION** see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
SG/P8045WO		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/GB 00/03307	25/08/2000	26/08/1999
Applicant		
COLLAG LIMITED et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

a. With regard to the **language,** the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

[ ] the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

[ ] contained in the international application in written form.

[ ] filed together with the international application in computer readable form.

[ ] furnished subsequently to this Authority in written form.

[ ] furnished subsequently to this Authority in computer readble form.

[ ] the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

[ ] the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. [ ] **Certain claims were found unsearchable** (See Box I).

3. [ ] **Unity of invention is lacking** (see Box II).

4. With regard to the **title,**

[ ] the text is approved as submitted by the applicant.

[X] the text has been established by this Authority to read as follows:

WATER-DISPERSIBLE AGROCHEMICAL COMPOSITIONS

5. With regard to the **abstract,**

[X] the text is approved as submitted by the applicant.

[ ] the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No. --

[ ] as suggested by the applicant.

[ ] because the applicant failed to suggest a figure.

[ ] because this figure better characterizes the invention.

[ ] None of the figures.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 00/03307

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A01N25/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 95 08265 A (DU PONT ;SANDELL LIONEL SAMUEL (US); WYSONG ROBERT DAVID (US)) 30 March 1995 (1995-03-30) claims page 5, line 12 - line 13 example 20 ---	1-26
X	DE 36 33 363 A (BAYER AG) 14 April 1988 (1988-04-14) claims 1,4,7 ---	1-26
X	WO 91 13546 A (DU PONT) 19 September 1991 (1991-09-19) examples 3-6 ---	1-24
X	EP 0 766 918 A (NISSAN CHEMICAL IND LTD) 9 April 1997 (1997-04-09) page 9 -page 12 --- -/--	1-26

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 November 2000	24/11/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Decorte, D

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Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 00/03307

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 302 983 A (CIBA GEIGY AG) 15 February 1989 (1989-02-15) page 5, line 20 - line 50	1-26

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/GB 00/03307

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9508265 A	30-03-1995	AT 167609 T	15-07-1998
		AU 689499 B	02-04-1998
		AU 7638394 A	10-04-1995
		BR 9407709 A	12-02-1997
		CA 2172399 A	30-03-1995
		CN 1131899 A	25-09-1996
		DE 69411276 D	30-07-1998
		DE 69411276 T	26-11-1998
		EP 0720427 A	10-07-1996
		ES 2118433 T	16-09-1998
		HU 76001 A,B	30-06-1997
		JP 9502975 T	25-03-1997
		PL 313733 A	22-07-1996
		TR 27764 A	04-08-1995
		US 5714157 A	03-02-1998
		ZA 9406999 A	12-03-1996
DE 3633363 A	14-04-1988	BR 8705044 A	24-05-1988
		ES 2005018 A	16-02-1989
WO 9113546 A	19-09-1991	AT 116099 T	15-01-1995
		AU 651335 B	21-07-1994
		AU 7332591 A	10-10-1991
		BR 9106147 A	09-03-1993
		CA 2083185 A	13-09-1991
		CN 1055461 A	23-10-1991
		CS 9100640 A	15-10-1991
		DE 69106349 D	09-02-1995
		DE 69106349 T	01-06-1995
		EP 0519937 A	30-12-1992
		ES 2065680 T	16-02-1995
		HU 61646 A	01-03-1993
		HU 210697 B	28-06-1995
		IE 73214 B	07-05-1997
		IL 97498 A	31-07-1995
		JP 5504964 T	29-07-1993
		LT 428 A,B	25-10-1994
		LV 10358 A,B	20-02-1995
		NZ 237388 A	28-04-1993
		PL 167613 B	30-09-1995
		PT 97010 A,B	31-12-1991
		RU 2098960 C	20-12-1997
		TR 27589 A	13-06-1995
		US 5372989 A	13-12-1994
		ZA 9101811 A	25-11-1992
EP 0766918 A	09-04-1997	US 5691276 A	25-11-1997
		WO 9600009 A	04-01-1996
		JP 8067604 A	12-03-1996
		PL 317932 A	28-04-1997
EP 0302983 A	15-02-1989	CH 672711 A	29-12-1989
		AU 594513 B	08-03-1990
		AU 7984387 A	16-02-1989
		ES 2007729 A	01-07-1989
		ZA 8707784 A	26-04-1989

PATENT COOPERATION TREATY

PCT

RECD 04 DEC 2001
WIPO PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
SG/P8045WO		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/GB00/03307	25/08/2000	26/08/1999
International Patent Classification (IPC) or national classification and IPC		
A01N25/14		
Applicant		
COLLAG LIMITED et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which hav been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
   - VI ☒ Certain documents cited
   - VII ☒ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
26/03/2001	30.11.2001
Name and mailing address of the international preliminary examining authority:	Authorized officer
European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Boletti-Cremers, K Telephone No. +49 89 2399 8541

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/03307

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:
Description, pages:

1-21 as originally filed

Claims, No.:

1-25 with telefax of 16/11/2001

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-25
	No:	Claims	
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-25
Industrial applicability (IA)	Yes:	Claims	1-25
	No:	Claims	

2. Citations and explanations
see separate sheet

VI. Certain documents cited

1. Certain published documents (Rule 70.10)

and / or

2. Non-written disclosures (Rule 70.9)

see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

POINTS V and VI.

The following documents , quoted in the I.S.R., have been considered as relevant for the examination of the present application . Their numbering will be adhered to for the rest of the procedure.

D1: WO-A-95 08265.
D2: DE-A-36 33 363.
D3: WO-A-91 13546.
D4: EP-A-0 766 918.
D5: EP-A-0 302 983.
D6: WO-A-004286, cited in the application.

Novelty.

1. In view of the fact that the water dispersible granular compositions (hereinafter called WDGC) of D1 are the result of a heat extrusion , whereas presently claimed WDGC are the result of the extrusion of a wet premix , followed by a drying step , the claims can be regarded as novel with respect to the content of D1.

2. Even if D2 discloses a composition of propanil with bensulfuron-methyl where the level of the active ingredient is said to be between 0.5 to 90 % , D2 does not pinpoint to a particular process to prepare said composition (see p. 3, lines 38-45 of D2) and therefore the claims can also be regarded as novel with respect to the content of D2.

3. D3 relates to compositions of agglomerates of solid particles bound together by a heat activated binder which are 3 different types of processes (see p.6 of D3) which are all different form the process to make the compositions on file .
Moreover , the specific examples which relate to the presence of the active sulphonyl urea component of D3 all encompass levels which are higher that 50 % by weight.

4. D4 discloses mixture of a sulfonylurea compound in combination with phenmedipham, ethofumesate , chloridazon, metamitron and triflusulfuron-methyl . Out of the 56 examples 5 examples (see examples 21-25 on pp. 11-12) relate to the manufacture of granules which starts form the kneading of an initial wet mixture suggesting that the initial mass of material is deformed by application of a shear , contrary to present application , were the initial wetted mix must be in the form of a free-flowing powder and thus avoids the formation of a paste (see p. 7 first paragraph of the application). Novelty with respect to the content of D4 is also acknowledged.

5. D5 disclose compositions having 3 active compounds in specific ratios in a WDGC (see p. 5 of D5) and no indication is set out in that document as how the WDGC were produced. Therefore the novelty of the claimed matter with respect to the content of that document can also be acknowledged .

6. Although D6 , as filed on 21.01.2000 and published on 27.07.2000, which claims a priority right on 22.01.1999, is not prior art according to the Chap II PCT proceedings, the extensive examination of that document , on the question whether it constitutes prior art or not for the examination of the novelty , will depend essentially on the analysis of the claimed priority rights of present application and D6 and will only be performed in the regional European proceedings to come

Inventive Step.

D1, D2 and D4 are considered as the most relevant prior art with respect to the invention as claimed.
Since those documents all concern the preparations of WDGC by means of processes which are either different or very similar (see especially D1) and which encompass the same ingredients as those of the application, no inventive step can be acknowledged at present for the WDGC on file and in extenso, for their use and the methods of treating plants on file .

The IPEA is aware that a comparative evidence is present in the application which show the benefit of using a WDGC in comparison with a wettable powder where bensulfuron-methyl (LONDAX 10WP) is present in an amount of 10%, but that comparison has not be

achieved with a comparable WDGC of any of the prior art quoted above and can thus not be accepted in order to establish the existence of an inventive step with respect to the claimed invention.

The Applicant is thus invited to show at the entry of the application in the regional proceedings , either by argumentation or technical evidence , that the claimed WDGC compositions on file possess any advantage or surprising feature when they are compared with the compositions of D1, D2 and D4 in order to enable the acknowledgment of the inventiveness of the application with respect to their contents and restrict the claimed matter to inventive embodiments only.

POINT VII.

(a) D1 to D5 should be quoted and discussed in the description .

(b) The description should be adapted to present reformulation of the claims when the application will reach the regional proceedings.

Claims

1. A water dispersible granular agrochemical composition comprising a primary agrochemical active ingredient comprising a sulfonyl urea at a level of less than 50% by weight of the composition and a dispersing agent wherein at least one component of the composition is liquid the composition being obtainable by a process comprising preparing a wetted mix in the form of a free-flowing powder comprising the primary active ingredient and the dispersing agent and optionally other components and extruding the mix to form an extrudate and drying the extrudate to form granules.
2. A composition according to claim 1 in which the primary active is a low use rate active ingredient.
3. A composition according to any one of the preceding claims in which the active ingredient is selected from bensulfuron-methyl, chlorsulfuron, cinosulfuron, metsulfuron-methyl, nicosulfuron, pirimisulfuron-methyl, rimsulfuron, sulfometuron-methyl, thifensulfuron-methyl, and tirflusulfuron-methyl.
4. A composition according to any one of the preceding claims in which the primary active ingredient is present at a level of less than 30% by weight of the composition.
5. A composition according to any one of the preceding claims in which the active ingredient comprises bensulfuron-methyl and/or chlorsulfuron.
6. A composition according to claim 5 comprising bensulfuron-methyl at a level of less than 10% by weight of the composition.
7. A composition according to any one of the preceding claims further comprising a high use rate secondary active ingredient.
8. A composition according to claim 7 in which the secondary active ingredient is present at a level greater than the level of the primary active ingredient.
9. A composition according to any one of claims 7 or 8 in which the secondary active is present at a level of at least 30%.
10. A composition according to any one of claims 7 to 9 in which the high use rate secondary active ingredient is selected from abamectin, atrazine, benomylbentazone, bifenox, bromoxynil, captan, carbendazim, chloridazon, chlorothalonil, chlortoluron, lambda-cyhalothrin, cyhexatin, cymoxynil, alpha-cypermethrin, deltamethrin, dimethomorph, diuron, ethofumesate, fibronil, flurtamone, glyphosate, imazamethabenz-methyl, imazapyr,

imazethapyr, imadacloprid, isoproturon, linuron, mancozeb, maneb, metamitron, methiocarb, metribuzin, milbectin, oxadixyl, oxyfluorfen, phenmedipham, propanil, propyzamide, simazine, thifensulfuron-methyl and thiram.

11. A composition according to claim 10 in which the secondary active ingredient comprises propanil.

12. A composition according to claim 11 in which the propanil is present at a level of at least 50% by weight of the composition.

13. A composition according to any one of the preceding claims in which the dispersing agent comprises an anionic and/or nonionic surfactant.

14. A composition according to claim 13 in which the dispersing agentr is selected from alkali metal salts of lignosulphonates, naphthalene sulphonate formaldehyde condensates, tristyrylphenol ethoxylate phosphate esters, aliphatic alcohol ethoxylates, alkylphenol ethoxylates, ethylene oxide/propylene oxide (EO-PO) block copolymers, "comb" graft copolymers and polyvinyl alcohol-vinyl acetate copolymers.

15. A composition according to any one of the preceding claims in which the weight ratio of dispersing agent to the low use rate primary active ingredient in the composition is 0.1 to 10:1.

16. A composition according to claim 16 in which the weight ratio of dispersing agent to the low use rate primary active ingredient in the composition is 0.4 to 6:1.

17. A composition according to any one of the preceding claims comprising, as the low use rate active, bensulfuron-methyl and further comprising propanil.

18. A composition according to claim 17 in which bensulfuron-methyl is present at a level of less than 1% by weight of the composition and propanil is present at a level of more than 50% by weight of the composition.

19. Use of a composition according any one of the preceding claims as an agrochemical.

20. A method of treating a plant by applying a herbicidally effective amount of a composition according any one of claims 1 to 18 to the plant or to the locus of the plant to be treated.

21. A method according to claim 20 in which the composition is mixed with a liquid carrier and applied to the plant or the locus of the plant.

22. A method according to any one of claims 20 or 21 in which the primary active is applied to the plant or the locus of the plant at a rate of use of less than 50 g/hectare.

23. A method according to any one of claims 20 to 22 in which the composition comprises, as a secondary active ingredient, propanil and the secondary active is applied to the plant or the locus of the plant at a rate of use of less than 7000g/hectare.

24. A process for the production of a composition according to any one of claims 1 to 18 comprising preparing a wetted mix in the form of a free-flowing powder comprising a primary active ingredient and a dispersing agent and optionally other components wherein at least one component of the composition is liquid and extruding the mix to form an extrudate and drying the extrudate to form granules.

25. A process according to claim 24 which comprises preparing a pre-mix comprising a secondary active ingredient and combining the pre-mix with the dispersing agent and the primary active ingredient to form the mix for extrusion.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
1 March 2001 (01.03.2001)

PCT

(10) International Publication Number
WO 01/13721 A1

(51) International Patent Classification[7]: A01N 25/14

(21) International Application Number: PCT/GB00/03307

(22) International Filing Date: 25 August 2000 (25.08.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
9920281.4 26 August 1999 (26.08.1999) GB

(71) Applicant *(for all designated States except US)*: **COLLAG LIMITED** [GB/GB]; Maidenstone Heath, Blundell Lane, Bursledon, Southampton SO31 1AA (GB).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **MISSELBROOK, John** [GB/GB]; Maidenstone Heath, Blundell Lane, Bursledon, Southampton SO31 1AA (GB).

(74) Agent: **GEARY, Stephen**; W.H. Beck, Greener & Co., 7 Stone Buildings, Lincoln's Inn, London WC2A 3SZ (GB).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:
— *With international search report.*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

WO 01/13721 A1

(54) Title: WATER-DISPERSIBLE AGROCHEMICAL COMPOSITIONS

(57) Abstract: The invention relates to novel compositions of biologically active agents containing less than 50 % by weight of a low use rate agrochemical active and a dispersing agent, which exhibit enhanced bio-availability on dilution and application in water.

WATER-DISPERSIBLE AGROCHEMICAL COMPOSITIONS

The invention relates to novel chemical compositions in particular, compositions of biologically active agents and their use. The invention is more particularly concerned with granular compositions of low dose-rate agrochemicals, for example pesticides, suitably prepared by an extrusion process, which deliver the active ingredient of the composition efficiently to the substrate, for example a crop, which is to be treated.

The advantages of dispersible granule formulations of pesticides are known and include their ease of handling and reduced worker exposure compared to powder or liquid formulations. G. A. Bell, "Chemistry and Technology of Agrochemical Formulations", Edited by D. A. Knowles (Kluver,1998), pages 80-114, describes a range of dispersible granule types and processes for their manufacture.

Dispersible granules may be prepared by extrusion. US 3,954,439 discloses granular compositions of a herbicidal agent and one or more surfactants and processes for the production of such compositions. The process described in US 3,954,439 is applicable to those herbicides which are substantially insoluble in water. This patent states that it is obviously desirable that the granules should have the highest possible content of active herbicidal material. This patent further states that the process is preferably carried out so as to give granules containing at least 50% of active herbicide material and that it is more preferable that the granules should contain more than this, that is at least 80% and even up to 95%. The patent also teaches that it is obviously important to keep the surfactant content down to a minimum, the total amount of surfactant preferably being from 5 to15%.

US 5,872,078 relates to dry, water soluble and/or water dispersible, agriculturally acceptable herbicidal compositions containing N-phosphonomethylglycerine or acceptable water-soluble salt thereof. The composition may comprise further optional ingredients, one of which may be a co-herbicide. A large number of co-herbicides are listed including sulfonylureas such as those available under the trade names Ally, Classic, Oust, Glean and mixtures thereof. A liquid surfactant is added

to this mixture and extrusion granulation may be used to process the compositions described to form granules.

Improved delivery and bioavailability of the active ingredient in agrochemical compositions, especially of water insoluble actives for example sulphonyl ureas, to achieve a desired agrochemical effect is desirable. It is also desirable to achieve this effect in as cost effective manner as possible and conventionally this has been achieved by including as high a level of active ingredient as possible in a formulated composition.

We have now surprisingly found that a composition containing a lower level of a primary active ingredient than conventionally employed in compositions containing the same ingredient, together with a suitable dispersing agent may conferenhanced delivery of the primary active ingredient to the crop to be treated. The invention is particularly applicable to a low use rate agrochemical for instance a pesticide, and especially a water-insoluble agrochemical. Furthermore, as this enhanced effect may be achieved at a lower level of active ingredient in the composition, the composition may include additional materials in the remaining "formulation space" to provide additional effects.

Accordingly, a first aspect of the invention provides an agrochemical composition comprising a primary agrochemical active ingredient, preferably a low use rate active ingredient, at a level of less than 50% by weight of the composition and a dispersing agent, preferably a nonionic and/or anionic surfactant(s).

The compositions according to the first aspect of the invention provide surprisingly beneficial bioavailability of the active for instance by making a larger proportion of the active biologically available in a liquid carrier, for example water, with which the composition is mixed in use than a known composition having a high level of active. The compositions disperse rapidly in the liquid carrier to form stable suspensions of the active material(s) and subsequently dissolve at a rate and to an extent higher than that achieved by conventional compositions containing the same ingredients. This property provides enhanced efficacy of the agrochemicals with attendant reduced crop damage. This enhanced bioavailability means that a given agrochemical effect may be obtained using a lower

total amount of agrochemical active thus providing environmental benefits through lower use of agrochemicals.

Further, as the concentration of the active is lower than conventionally employed, there is a reduced risk that some of the active will not be dispersed or dissolve in the liquid carrier. Hence the risk of poor disperion or dissolution of the active in a liquid carrier leading to high localised concentrations of the active penetrating to the crop especially the roots of plants and possibly damaging the crop is reduced.

A further advantage is that the lower level of primary active ingredient provides enhanced flexibility in formulating a composition as compared to conventional compositions employing high levels of active. Thus, the formulator may include a secondary active ingredient or other materials as desired in the composition to provide an optimum effect or balance of properties.

It has also been surprisingly found that when low use-rate pesticides, such as water-insoluble compounds including sulfonyl ureas, for example as described in US 5,872,078, are employed as the primary active ingredient with a secondary high rate use pesticide and a suitable dispersing agent at the required level, the rate and extent of solubility and thus the bioavailability, of the primary active or both the actives may be increased as compared to granules containing the equivalent amount of each material alone. Optimally, the primary and secondary actives are intimately mixed in suitable proportions. Suitably, optional conventional other ingredients such as one or more additional surfactants are included in the formulation and the ingredients are processed into a suitable form, for example water-dispersible granules.

Accordingly the invention also provides in a preferred embodiment an agrochemical composition comprising as a primary active ingredient, a low use rate agrochemical active ingredient, at a level of less than 50% by weight of the composition and a secondary active ingredient, preferably a high use rate active ingredient, and a dispersing agent, preferably an anionic and/or nonionic surfactant.

In addition to the advantages referred to above for composition according to the invention, the compositions provide at least an enhanced effect as regards the primary active and suitably an effect greater than the combined additive affect of both the primary and secondary active is observed where the composition contains a primary and secondary active.

The term "low use rate" active denotes those agrochemical actives which typically are applied at a rate of less than 100g/hectare and the term "high use rate" active denotes those agrochemical actives which typically are applied at a rate of more than 1000g/hectare.

The compositions of the present invention result in the individual components being used at lower rates and with less phytotoxicity than conventional compositions of the said active materials, against a wide range of pests and diseases.

The level of primary active ingredient is suitably selected according to the particular compound to be used but is preferably less than 30% by weight of the composition, especially in the case of a low use rate active. For example, chlorsulfuron may suitably be employed at a level of less than 30%, for example 25% by weight of the composition. In a preferred embodiment, the primary active ingredient, for example bensulfuron, is present at a level of less than 10% and more preferably less than 2% by weight of the composition. In an especially preferred embodiment the primary active is present at a level of less than 1%. Suitably, the composition will contain the primary active at a level at which, on mixing with a liquid carrier, it provides a concentration of active which will provide a benefical effect in treating crops. This level may suitably be at 0.05% but is preferably at least 0.1% and desirably at least 0.2% by weight of the composition although the precise level may be adjusted according to the particular application and the particular primary active present in the composition.

Where a second active is employed, it is suitably present at a level greater than the level of the primary active ingredient. In a preferred embodiment the secondary active is present at a level of at least 30%, more preferably at least 50%, optimally at least 65%, for example 75% by weight of the composition

The invention comprises a dry, free-flowing, dustless and rapidly dispersing granular formulation containing a low use rate pesticide or mixture of pesticides together with an additional high use rate pesticide. The terms composition and formulation are used herein to have the same meaning.

A suitable dispersing agent(s) is/are incorporated into the formulation at a specific ratio so as to enable the rapid dispersion and subsequent dissolution of the low use rate and high use rate active material upon dilution and subsequent application. Suitably, the weight ratio of dispersing agent to the low use rate primary active ingredient in the composition is 0.1 to 10:1, preferably 0.4 to 6:1, for example about 4:1 and about 5:1.

The invention is particularly suitable for, but not limited to, such low use-rate pesticides as: Abamectin, imidazolinone, azoxystrobin, bensulfuron-methyl, carfentrazone-ethyl, chlorsulfuron, cinosulfuron, clodinafop, clopyralid, lambda-cyhalothrin, deltamethrin, diflufenican, emamectin benzoate, fibronil, flurtamone, imazamethabenz-methyl, imazapyr, imazethapyr, imadacloprid, metsulfuron-methyl, milbectin, nicosulfuron, pirimisulfuron-methyl, rimsulfuron, sulfometuron,-methyl, thifensulfuron-methyl, tribenuron-methyl, and tirflusulfuron-methyl. Preferably the low use rate pesticide is a sulfonyl urea.

Suitable high use rate pesticides include: Abamectin, atrazine, benomylbentazone, bifenox, bromoxynil, captan, carbendazim, chloridazon, chlorothalonil, chlortoluron, lambda-cyhalothrin, cyhexatin, cymoxynil, alpha-cypermethrin, deltamethrin, dimethomorph, diuron, ethofumesate, fibronil, flurtamone, glyphosate, imazamethabenz-methyl, imazapyr, imazethapyr, imadacloprid, isoproturon, linuron, mancozeb, maneb, metamitron, methiocarb, metribuzin, milbectin, oxadixyl, oxyfluorfen, phenmedipham, propanil, propyzamide, simazine, thifensulfuron-methyl and thiram.

In an especially preferred embodiment, the low use rate pesticide comprises bensulfuron-methyl and the high use rate pesticide comprises propanil.

In a preferred embodiment, the dispersing agent comprises a surfactant with nonioic surfactants and especially anionic surfactants being preferred. Examples of suitable dispersing

agents include alkali metal, preferably sodium salts of lignosulphonates, naphthalene sulphonate formaldehyde condensates, tristyrylphenol ethoxylate phosphate esters, aliphatic alcohol ethoxylates, alkylphenol ethoxylates, ethylene oxide/propylene oxide (EO-PO) block copolymers, "comb" graft copolymers and polyvinyl alcohol-vinyl acetate copolymers. Other dispersing agents known in the art may be employed as desired.

In addition to the dispersing agent, other components may be present in the composition for example a wetting agent. Suitable wetting agents include: alkali metal salts of alkylaryl sulphonates, alkyl aryl sulphosuccinates and alkyl sulphates, preferably as the sodium salt. Other wetting agents, and other excipients known to those skilled in the art may be employed as desired including disintegrants for example: Bentonite, modified starch and polyvinyl pyrrolidone; stabilisers, for example citric acid, polyethylene glycol and butylated hydroxy toluene; and fillers, for example, starch, lactose, china clay, sucrose and kaolin; and flow-aids.

The granular compositions are preferably prepared by the method described in PCT application PCT/GB00/00163 the contents of which are hereby incorporated by reference. Suitably the process comprises, preparing a mix in the form of a free-flowing powder, preferably a homogeneous powder, comprising the primary active ingredient and a dispersing agent and optionally other components, preferably without forming a paste, and extruding the pre-mix in an extruder, for example a low pressure extruder to form the granules. A pre-mix optionally containing the secondary active ingredient may be mixed with the dispersing agent and the primary active ingredient to form the mix for extrusion. The dispersing agent may be liquid in which case an additional liquid component is not required although a further liquid component may be included as desired.

Suitable apparatus for the blending step(s) include a low-shear, high intensity blender such as a Lodige Ploughshare mixer, ribbon, Y-cone, double cone or trough blender, so that a free-flowing powder is formed. The mix is fed directly or indirectly into a suitable low-pressure extruder, such as that described in WO 96/26828, so that the premix is compacted against the apertures in the screen and forced through.

In a preferred embodiment, the composition of the mix and the extruder settings are such that the formation of a paste before extrusion is avoided and the material being processed remains a free flowing particulate material during the formation of the pre-mix. In particular, the material optimally does not form a paste prior to extrusion. However, as the composition may contain one or more liquid components, it may be wet or dry provided that it remains free-flowing and particulate during the process. In this context, a paste may be considered as a mass of material, for example an agglomerate, which contains sufficient liquid or is at such a temperature that the particulate material being processed forms into an agglomerate which is mouldable or deformable and which is not free-flowing. Thus, a paste does not disintegrate into finer particles on application of shear, for example by rubbing between fingers, but rather remains as an agglomerated mass and the shear acts to mould or deform the agglomerate.

If desired, the components of the composition, either in sequence, all together or some in sequence and others together are first mixed, for example in a blender so that a uniform blend is obtained which is then passed through a suitable milling system such as an air mill, pin mill or air-swept impact mill so that a fine powder (the pre-mix) comprising an average particle size of 0.5 to 20 microns, or more preferably between 0.5 to5 microns is obtained. The powder thus obtained is suitably agglomerated, so that uniform, dust-free granules are obtained, preferably by the process described in PCT/GB00/00163. This preferred method involves the extrusion of the wetted powder which is then in the form of a freely flowing homogeneous powder, in a low temperature, low pressure extruder, for example as described in EP-A-812256.

Where present, the low use rate and high use rate agrochemicals may be combined in the formation of the dry pre-mix with the other formulation ingredients for example dispersing agents or alternatively the pre-mix may be prepared with one of the agrochemicals and the other added to the milled pre-mix. This alternative approach is preferred when the high use rate pesticide is propanil which is suitably incorporated in the dry pre-mix, and the low use rate pesticide is then added to the pre-mix and blended with it prior to granulation.

In a second aspect, the invention provides a method of treating a plant by applying a herbicidally effective amount of a composition according to the present invention to the plant or to the locus of the plant.

The present invention enables the composition of the invention to be used at a lower rate of use (mass of composition / unit area, typically grammes per hectare) to achieve a given effect than known compositions. Suitably the agrochemical active is applied to the plant or locus of the plant at a rate of use of less than 75%, more preferably less than 50% of the conventional rate of use for the active in commercially available compositions.

In a preferred embodiment, a composition comprising a sulphonyl urea low use rate active for example bensulfuron, is applied in use at a rate of use of less than 50 g/hectare, especially less than 30g/hectare and optimally less than 20 g/hectare. Typically, a commercially available composition containing in excess of 50% by weight of the composition of bensulfuron-methyl may be employed at a rate of use of 60g/hectare or more. In another preferred embodiment, the composition comprises a high use rate secondary active comprising propanil in addition to a sulphonyl urea active, for example bensulfuron, and suitably the secondary active is applied in use at a rate of less than 7000g/hectare, preferably less than 5000g/hectare and especially at a rate of less than 3200g/hectare.

Where the plant is a weed, suitably, the treatment is such as to control or kill the weed. Generally, the composition is applied to the plant or its locus by means of a liquid carrier, typically water, with which the composition is mixed prior to application. If desired, the composition may be mixed with a liquid carrier to form a concentrate suitable for subsequent mixing with a liquid carrier. The application of the composition to the plant or its locus in solid or concentrate form especially where water is present in the vicinity of the plant through natural precipitation is also within the ambit of the invention.

In water, suitably the composition is diluted for use to a level of 10 to 500 mg/l and preferably 20 to 300mg/l. The dilution is suitably selected according to the composition used, the type of application, the state of growth of the plants to be treated and other factors known to those skilled in the art.

In a third aspect, the invention provides for use of a composition according to the invention as an agrochemical, for example a low use rate herbicide.

This invention relates to novel compositions and to methods of treating plants, for example killing or controlling weeds by applying a reduced amount of the active ingredient(s), suitably diluted in water, than that normally recommended for such active(s) against such weeds. In addition the invention allows for the avoidance of subsequent applications of the said actives, thus further reducing the amount of pesticide used.

The following examples illustrate the invention in an non-limiting manner.

Example 1

Chlorsulfuron 25 WG

Ingredient	Trade name	% w/w
Chlorsulfuron technical (95%)	(technical a.i.)	26.32
Sodium lignosulfonate	Ultrazine NA	12.50
Dodedyl benzene sulphonate, Sodium salt	Arylan SX85	5.00
Lactose	Lactose	56.18

Method

The chlorsulfuron technical was airmilled using a Gem-T airmill before combining with other components. The technical, Ultrazine and Arylan components were blended until uniform ni a high speed blender. The lactose was then added and the formulation blended for a further 15 seconds. 12% distilled water was added whilst blending. The wetted premix (free flowing powder) was fed to a basket extruder as described in EP-A-812256 through a 1mm screen. A compacted extrudate was obtained and the resulting granules dried at 60C for 8 minutes. The dried granules were then sieved through 2 mm and 500 micron sieves.

Comparative Example A

Chlorsulfuron 75 WG

Ingredient	Trade name	% w/w
Chlorsulfuron technical (95%) technical a.i.)		78.95
Sodium lignosulfonate	Ultrazine NA	12.50
Di isopropyl naphthalene sulfonate, sodium salt	Galoryl MT704	1.00
Lactose	Lactose	7.55

Method

The chlorsulfuron technical was airmilled using a Gem-T airmill before combining with other components. The milled chlorsulfuron technical, Ultrazine and Galoryl components were blended until uniform in a high speed blender. The lactose was then added and the formulation blended for a further 15 seconds. 17% distilled water was added whilst blending. The wetted premix (free flowing powder) was fed to a basket extruder as described in EP-A-812256 through a 1mm screen. A compacted extrudate was obtained and the resulting granules dried at 60C for 8 minutes. The dried granules were then sieved through 2 mm and 500 micron sieves.

The solubility of the compositions produced according to Example 1 and Comparative Example A and Glean (commercially available 75 WG product) and airmilled technical was tested using the method below:

Solubility test method

200 mls water was poured into a jacketed glass vessel and allowed to reach 25C. A Grant recirculator was used to maintain the temperature at 25C +/- 1C. A magnetic stirrer at a set speed was used to stir the water. The specified weight of granules was then added to the water and allowed to disperse for 30 seconds before a timer was started. A 2 mls sample was removed using a syringe after 5 minutes and filtered using a 0.45 micron syringe filter. The solution was then analysed to

determine the active concentration using a HPLC method. The theoretical concentration assuming 100% solubility was calculated using an assay obtained using the HPLC.

The following data was obtained:

Formulation	Product	Dilution rate (mgs a.i. /L)	Type of water used to dilute granules	% active added to water that dissolved after 5 minutes
Example 1	25 WG	69	Distilled	98
Comparative Example A	75 WG	72	Distilled	95
Glean (Du Pont)	75 WG	72	Distilled	67
Airmilled technical	-	91	Distilled	<2

Conclusions

Both the 75 and 25 extruded WG formulations have a significantly higher solubility in distilled water compared to the commercial product. The technical is not readily soluble in distilled water at this temperature.

Example 2

Bensulfuron-methyl 1 WG

Ingredient	Trade name	% w/w
Bensulfuron methyl technical (95%)	(technical a.i.)	1.05
Naphthalene sulfonic acid	Galoryl DT505	12.70
Formaldehyde condensate, sodium salt		
Di isopripyl naphthalene sulfonate, sodium salt	Galoryl MT704	1.00
Lactose	Lactose	85.25

Method

The technical and Galoryl DT505 were blended together until uniform. The blend was then airmilled using a Gem-T airmill. The milled premix, Galoryl MT704 and lactose were blended until uniform in a high speed blender. The lactose was then added and the formulation blended for a further 15 seconds.. 12% distilled water was added whilst blending. The wetted premix (free flowing powder) was fed to a basket extruder as described in EP-A-812256 through a 1mm screen. A compacted extrudate was obtained and the resulting granules dried at 60C for 8 minutes. The dried granules were then sieved through 2mm and 500 micron sieves.

Comparative Example B

Bensulfuron-methyl 60 WG

Ingredient	Trade name	% w/w
Bensulfuron methyl technical (95%)	(technical a.i.)	64.21
Naphthalene sulfonic acid	Galoryl DT505	12.70
Formaldehyde condensate, sodium salt		
Di isopripyl naphthalene sulfonate, sodium salt	Galoryl MT704	1.00
Lactose	Lactose	22.08

The composition of Comparative Example B was prepared using the method set out in Example 2.

The solubility of the compositions of Example 2 and Comparative Example B were then tested using the method detailed in Example 1. The following data was obtained:

Formulation	Product	Dilution rate (mgs a.i. /L)	Type of water used to dilute granules	% active added to water that dissolved after 5 minutes
Londax	60 WG	300	Tap	12
Comparative Example B	60 WG	291	Tap	25

Londax	60 WG	75	Tap	19
Comparative Example B	60 WG	73	Tap	46
Example 2	1 WG	240	Tap	71

Example 3

Propanil and bensulfuron-methyl combined WG (75% propanil and 0.75% bensulfuron)

Propanil Premix

A premix of Propanil was prepared as follows:

Ingredient	Trade name	% w/w
Propanil technical (97.0% a.i.)	Technical	82.47
Starch	Paselli	1.00
Nonionic surfactant and sodium Lignosulphonate blend	Stepsperse DF 500	5.00
Modified sodium lignosulphonate	Ufoxane 3A	5.00
Hydrated aluminium silicate	China Clay	to 1.00

The ingredients were blended in a medium shear, high speed blender for 5 minutes until uniform. The resulting mixture was passed through an air mill to obtain a fine powder. The powder was wetted with 19.5% water (based on the dry weight of powder) an blended until a damp free flowing powder was formed. The premix was used in the following blends with bensulfuron:

Ingredient	Trade name	% w/w
Bensulfuron methyl technical (95%)	(technical a.i.)	0.79
Propanil 80% milled premix	-	93.75
Naphthalene sulfonic acid Formaldehyde condensate, sodium salt	Galoryl DT505	0.31
China clay	China clay GTY	5.15

The technical and Galoryl DT505 were blended together until uniform. The blend was then airmilled using a Gem-T airmill. The milled bensulfuron-methyl and milled propanil premixes, Galoryl MT704 and china clay were blended until uniform in a high speed blender. 17% distilled water was added whilst blending. The wetted premix (free flowing powder) was fed to a basket extruder as described in EP-A-812256 through a 1mm screen. A compacted extrudate was obtained and the resulting granules dried at 60C for 8 minutes. The dried granules were then sieved through 2mm and 500 micron sieves.

Example 4

Propanil and bensulfuron-methyl combined WG (75% propanil and 0.375% bensulfuron)

Ingredient	Trade name	% w/w
Bensulfuron-methyl technical (95%)	(technical a.i.)	0.39
Propanil 80% milled premix	-	93.75
Naphthalene sulfonic acid Formaldehyde condensate, sodium salt	Galoryl DT505	0.16
China clay	China clay GTY	5.70

The technical and Galoryl DT505 were blended together until uniform. The blend was then airmilled using a Gem-T airmill. The milled bensulfuron-methyl and milled propanil premixes, Galoryl MT704 and china clay were blended until uniform in a high speed blender. 17% distilled water was added whilst blending. The wetted premix (free flowing powder) was fed to a basket extruder as described in EP-A-812256 through a 1mm screen. A compacted extrudate was obtained and the resulting granules dried at 60C for 8 minutes. The dried granules were then sieved through 2mm and 500 micron sieves.

The above combination formulations were tested using the solubility method detailed in Example 1. The following data was obtained:

Formulation	% bensulfuron-methyl a.i.	Dilution rate (mgs a.i. /L)	Type of water used to dilute granules	% active added to water that dissolved after 5 minutes
Example 3	0.75	75	Tap	66
	0.75	112.5	Tap	64
Example 4	0.375	37.5	Tap	83
	0.375	56	Tap	84

Further solubility testing up to 2 hours was carried out using the same method as for Example 1 except the granules were diluted in 1000 mls water and samples were taken after 5, 30, 60 90 and 120 minutes. The following results were obtained using 37.5 mgs a.i/litre (all in tap water). Data for Comparative Example B (bensulfuron-methyl 60 WG) and Londax (commercial bensulfuron-methyl 60 WG) at the same dilution rate is shown for comparison.

Time (mins)	% active added to water that dissolved		
	Example 5	Comparative Example B	Londax
5	67	42	15
30	67	52	32
60	67	57	39
90	66	57	49
120	69	62	53

Conclusions

The solubility rate of bensulfuron-methyl in a granule which also contains an active that is used a high rate per hectare, is significantly higher compared with diluting the bensulfuron-methyl as a 60 WG.

Example 5

Propanil and bensulfuron-methyl combined WG (75% propanil and 0.24% bensulfuron)

Ingredient	Trade name	% w/w
Bensulfuron methyl technical (95%)	(technical a.i.)	0.25
Propanil 80% milled premix	-	93.72
Naphthalene sulfonic acid	Galoryl DT505	0.10
Formaldehyde condensate, sodium salt		
China clay	China clay GTY	5.90

The processing method set out in Example 4 was employed, with the bensulfuron-methyl being milled as a premix with the Galoryl DT505. The solubility of the bensulfuron-methyl in the above formulation was then tested using the method set out in Example 4. The following results were obtained using 25 mgs and 31.3 mgs bensulfuron-methyl a.i./litre (in tap water).

Time (mins)	% bensulfuron-methyl active added to water that dissolved	
	Example 5 (25 mgs/L)	Example 5 (31.3 mgs/L)
5	89	91
30	90	92
60	94	92
90	93	96
120	97	95

Field Evaluation

A composition according to Example 4 was evaluated in the field in comparison with commercial formulations containing the same active ingredients.

Treatment Details

Number	Treatment Composition	Rate of use (g/Hectare) Product
Control	Untreated Control	-
1	Stam 80 EDF	4,000g at Growth Stage BBCH 12-13 8,000g at Growth Stage BBCH 21-21
2	Stam 80 EDF + Londax 60	4,000g at Growth Stage BBCH 12-13 100g at Growth Stage BBCH 12-13
3	Example 4	4,000g at Growth Stage BBCH 12-13

The above treatments were applied in 400 l water/ha on Rice *v.loto* against Gramineae family weeds. The weeds were assessed at –1, +4, +16 and +32 days after application by the efficacy assessment guidelines provided by EPPO Guidelines PP1/181(2), PP1/152(2) and 1/62(2).
Stam 80 EDF is a commercial formulation containing 80% propanil in the form of an extruded granule. Londax 60 is a commercial formulation containing 60% bensulfuron-methyl in the form of a fluid bed granule.

Results

Assessment : 1 day before 1st Application

Weeds	Control	Treatment 1			Treatment 2			Treatment 3		
	% cov.	% cov.	% eff.	Sympt.	% cov.	% eff.	Sympt.	% cov.	% eff.	Sympt.
Heteranthera limosa	38.0	37.0	0.0	n.a.	35.0	0.0	n.a.	35.0	0.0	n.a
Heteranthera reniformis	0.0	1.0	0.0	n.a.	0.0	0.0	n.a.	0.0	0.0	n.a.
Echinochloa crus-galli	1.0	1.0	0.0	n.a.	1.0	0.0	n.a.	1.0	0.0	n.a.
Panicum dichotomiflorum	1.0	1.0	0.0	n.a.	1.0	0.0	n.a.	1.0	0.0	n.a.
Scirpus maritimus	1.0	1.0	0.0	n.a.	1.0	0.0	n.a.	2.0	0.0	n.a.
Scirpus mucronatus	1.0	1.0	0.0	n.a.	2.0	0.0	n.a.	1.0	0.0	n.a.

Assessment : 4 days after 1st Application

Weeds	Control	Treatment 1			Treatment 2			Treatment 3		
	% cov.	% cov.	% eff.	Sympt.	% cov.	% eff.	Sympt.	% cov.	% eff.	Sympt.
Heteranthera limosa	55.0	55.0	70.0	WC	34.0	80.0	W	40.0	50.0	W
Heteranthera reniformis	0.5	0.0	0.0	n.a.	0.6	0.0	n.a.	0.0	0.0	n.a.
Echinochloa crus-galli	7.0	0.0	0.0	n.a.	1.0	0.0	n.a.	1.0	0.0	n.a.
Panicum dichotomiflorum	5.5	0.0	0.0	n.a.	1.0	0.0	n.a.	1.0	0.0	n.a.
Scirpus maritimus	1.0	4.0	90.0	W	0.0	0.0	n.a.	3.0	70.0	W
Scirpus mucronatus	2.0	1.0	60.0	W	2.0	60.0	W	5.0	70.0	W

Assessment : 16 days after 1st Application

Weeds	Control	Treatment 1			Treatment 2			Treatment 3		
	% cov.	% cov.	% eff.	Sympt.	% cov.	% eff.	Sympt.	% cov.	% eff.	Sympt.
Heteranthera limosa	55.0	1.0	99.0	W.C.	18.0	80.0	W.C.	2.0	98.0	W
Heteranthera reniformis	0.0	0.0	0.0	n.a.	0.0	0.0	n.a.	0.0	0.0	n.a.
Echinochloa crus-galli	10.0	0.0	0.0	n.a.	1.0	0.0	n.a.	0.0	0.0	n.a.
Panicum dichotomiflorum	15.0	0.0	0.0	n.a.	1.0	0.0	n.a.	0.0	0.0	n.a.
Scirpus maritimus	5.0	0.0	0.0	n.a.	0.0	0.0	n.a.	1.0	98.0	W
Scirpus mucronatus	15.0	0.0	0.0	n.a.	0.0	0.0	n.a.	0.0	0.0	n.a.

Assessment : 32 days after 1st Application

Weeds	Control	Treatment 1			Treatment 2			Treatment 3		
	% cov.	% cov.	% eff.	Sympt.	% cov.	% eff.	Sympt.	% cov.	% eff.	Sympt.
Heteranthera limosa	37.0	0.0	0.0	n.a.	1.0	0.0	n.a.	0.0	0.0	n.a
Heteranthera reniformis	1.0	0.0	0.0	n.a.	0.0	0.0	n.a.	0.0	0.0	n.a.
Echinochloa crus-galli	10.0	0.0	0.0	n.a.	0.0	0.0	n.a.	0.0	0.0	n.a.
Panicum dichotomiflorum	15.0	0.0	0.0	n.a.	2.0	0.0	n.a.	0.0	0.0	n.a.
Scirpus maritimus	5.0	0.0	0.0	n.a.	0.0	0.0	n.a.	0.0	0.0	n.a.
Scirpus mucronatus	32.0	0.0	0.0	n.a.	0.0	0.0	n.a.	0.0	0.0	n.a.

Abbreviations :

% cov. : % area covered by weeds

% eff. : % herbicide efficacy (% of weeds showing necrotic symptoms):

Sympt. : symptoms (W: withered; C:chlorotic; n.a. not applicable)

Conclusions

The above results demonstrate the composition of Example 4 (15g/ha bensulfuron-methyl combined with 3,000 g/ha propanil) provides equivalent control to the commercial products tested when applied at less than 1/3rd of the propanil in the Stam 80 EDF treatment (two applications, one 3200 a.i. g/ha and one 6400 a.i. g/ha propanil) and ¼ of the Londax rate (one application of 60g/ha bensulfuron-methyl tank mixed with one application of 3,200 g/ha propanil).

Claims

1. An agrochemical composition comprising a primary agrochemical active ingredient at a level of less than 50% by weight of the composition and a dispersing agent.
2. A composition according to claim 1 in which the primary active is a low use rate active ingredient.
3. A composition according to any one of the preceding claims in which the active ingredient is selected from abamectin, imidazolinone, azoxystrobin, bensulfuron-methyl, carfentrazone-ethyl, chlorsulfuron, cinosulfuron, clodinafop, clopyralid, lambda-cyhalothrin, deltamethrin, diflufenican, emamectin benzoate fibronil, flurtamone, imazamethabenz-methyl, imazapyr, imazethapyr, imadacloprid, metsulfuron-methyl, milbectin, nicosulfuron, pirimisulfuron-methyl, rimsulfuron, sulfometuron,-methyl, thifensulfuron-methyl, tribenuron-methyl, and tirflusulfuron-methyl.
4. A composition according to any one of the preceding claims in which the active ingredient is a sulfonyl urea.
5. A composition according to any one of the preceding claims in which the primary active ingredient is present at a level of less than 30% by weight of the composition.
6. A composition according to any one of the preceding claims in which the active ingredient comprises bensulfuron-methyl and/or chlorsulfuron.
7. A composition according to claim 6 comprising bensulfuron-methyl at a level of less than 10% by weight of the composition.
8. A composition according to any one of the preceding claims comprising as a primary active ingredient, a low use rate agrochemical active ingredient, at a level of less than 50% by weight of the composition, a high use rate secondary active ingredient and a dispersing agent.
9. A composition according to claim 8 in which the secondary active ingredient is present at a level greater than the level of the primary active ingredient.
10. A composition according to any one of claims 8 or 9 in which the secondary active is present at a level of at least 30%.
11. A composition according to any one of claims 8 to 10 in which the high use rate secondary active ingredient is selected from abamectin, atrazine, benomylbentazone, bifenox, bromoxynil, captan, carbendazim, chloridazon, chlorothalonil, chlortoluron, lambda-cyhalothrin, cyhexatin, cymoxynil, alpha-cypermethrin, deltamethrin, dimethomorph, diuron,

ethofumesate, fibronil, flurtamone, glyphosate, imazamethabenz-methyl, imazapyr, imazethapyr, imadacloprid, isoproturon, linuron, mancozeb, maneb, metamitron, methiocarb, metribuzin, milbectin, oxadixyl, oxyfluorfen, phenmedipham, propanil, propyzamide, simazine, thifensulfuron-methyl and thiram.

12. A composition according to claim 11 in which the secondary active ingredient comprises propanil.

13. A composition according to claim 12 in which the propanil is present at a level of at least 50% by weight of the composition.

14. A composition according to any one of the preceding claims in which the dispersing agent comprises an anionic and/or nonionic surfactant.

15. A composition according to claim 14 in which the dispersing agentr is selected from alkali metal salts of lignosulphonates, naphthalene sulphonate formaldehyde condensates, tristyrylphenol ethoxylate phosphate esters, aliphatic alcohol ethoxylates, alkylphenol ethoxylates, ethylene oxide/propylene oxide (EO-PO) block copolymers, "comb" graft copolymers and polyvinyl alcohol-vinyl acetate copolymers.

16. A composition according to any one of the preceding claims in which the weight ratio of dispersing agent to the low use rate primary active ingredient in the composition is 0.1 to 10:1.

17. A composition according to claim 16 in which the weight ratio of dispersing agent to the low use rate primary active ingredient in the composition is 0.4 to 6:1.

18. A composition according to any one of the preceding claims comprising, as the low use rate active, bensulfuron-methyl and further comprising propanil.

19. A composition according to claim 18in which bensulfuron-methyl is present at a level of less than 1% by weight of the composition and propanil is present at a level of more than 50% by weight of the composition.

20. Use of a composition according any one of the preceding claims as an agrochemical.

21. A method of treating a plant by applying a herbicidally effective amount of a composition according any one of claims 1 to 19 to the plant or to the locus of the plant to be treated.

22. A method according to claim 21 in which the composition is mixed with a liquid carrier and applied to the plant or the locus of the plant.

23. A method according to any one of claims 21 or 22 in which the composition comprises a sulfonyl urea and wherein the primary active is applied to the plant or the locus of the plant at a rate of use of less than 50 g/hectare.

24. A method according to any one of claims 21 to 23 in which the composition comprises, as a secondary active ingredient, propanil and the secondary active is applied to the plant or the locus of the plant at a rate of use of less than 7000g/hectare.

25. A process for the production of a composition according to any preceding claim comprising preparing a mix in the form of a free-flowing powder comprising a primary active ingredient and a dispersing agent and optionally other components and extruding the mix to form granules.

26. A process according to claim 25 which comprises preparing a pre-mix comprising a secondary active ingredient and combining the pre-mix with the dispersing agent and the primary active ingredient to form the mix for extrusion.